REMARKS

Applicants have corrected an error in the formula for the titanium compound $Ti(OR^2)_cX_{d-c}$ occurring at line 10 of page 5 of the disclosure, line 23 of page 12 of the disclosure and in claims 3 and 32. Applicants have amended the subscript following X from "d-c" to read – d --. The formula was inconsistent with the specific titanium compounds listed at lines 20 to 30 of page 13 of the disclosure and in claims 6 and 35 as originally filed. For example in the formula $Ti(OCOC_6H_5)Cl_3$, in original claims 6 and 35, the valence of titanium is 4 and c is 1. The sum of c and d is 4 so d is 3. However the formula had the subscript for the halide as d-c which is 2. It is respectfully submitted this is the correction of a clerical error and adds no new matter to the specification as filed and will necessitate no further search on the part of the Examiner. It is respectfully submitted the amendment is in good order for entry into the specification and the same is respectfully solicited.

Applicants have amended claim 1 to limit the ratio of aluminum from the catalyst and the co-catalyst to titanium to from 25:1 to 80:1. This is supported by the teaching in the specification at page 4 lines 23 and 32; page 7 line 28; and page 16 line 30. It is respectfully submitted the amendment adds no new subject matter to the specification and will necessitate no further search on the part of the Examiner.

The Examiner has considered the response filed to the Office Action of January 29, 2004. The Examiner has allowed claim 30 to 58 but rejected claims 1 to 29. As a result of the amendment, claims 1 – 29 have been limited to a ratio of Al:Ti from 25:1 to 80:1 which is substantially less than the ratio of Al:TI of 106 the Examiner has calculated for example 12 b) of the applied reference.

It is respectfully submitted revised claim 1 and claims 2 through 29 which depend therefrom are inventive over example 12 b) of the applied reference and as such amended claim 1 and claims 2 – 29 which depend therefrom meet the requirements of 35 U.S.C. §103. It is respectfully submitted the amended claims are in good order for allowance and the same is respectfully solicited.

The Examiner rejected former claims 1 – 29 pursuant to 35 U.S.C. §102 in view of example 12 b) of the applied reference, EP 0 595 574 B1 to Berardi et al.

The requirements for a prior reference to sustain a rejection pursuant to 35 U.S.C. §102 have been judicially considered in Kahman v. Kimberly - Clark Corp. 218 USPQ 781 (Fed. Cir. 1984) and Leinoff v. Louis Milona & Sons, Inc. 220 USPQ 845 (Fed. Cir. 1984). The courts have held that to sustain a rejection pursuant to 35 U.S.C. §102 each reference individually must identically disclose all the elements of the claim sought to be rejected.

In the current Office Action, the Examiner notes example 12b) of the applied reference teaches a ratio of Al:Ti of 106 which was within the scope of former claim 1 which claimed a ratio of Al:Ti of greater than 25. Amended claim 1 now excludes a ratio of Al:Ti greater than 80:1. It is respectfully submitted the revised claims are novel over the teachings of the applied reference.

While example 12 does not disclose a continuous process, any rate of polymer production, nor any rate of addition of aluminum the Examiner appears to be arguing that examples 12 and 13 may be combined as they represent the same invention. Applicants respectfully traverse the Examiner's argument. Applicants enclose the

declaration of one of the inventors discussing examples 12 and 13 of the applied reference.

It is respectfully submitted example 12 b) discloses a batch process in which there is no co catalyst injected into the reactor during the polymerization. In a batch process all of the catalyst and co catalyst are injected prior to the reaction. There is no subsequent continuous injection of either catalyst or co-catalyst accordingly, the Al ppm for a batch reaction is 0. Additionally it is noted that the catalyst, co-catalyst, reactors and feed of examples 12b) and 13b) are different and one of ordinary skill in the art would not consider the production rate of example 13 b) to apply to example 12 b). In fact, as noted, a batch process has an aluminum ppm based on the production of polymer of 0 because no additional Al is added to the reactor and accordingly, rather than identically disclosing the process of the claims presently under consideration example 12 b) of the applied reference teaches against the claimed subject matter.

In view of the foregoing it is respectfully submitted that all of the amended claims meet the requirements of 35 U.S.C. §102 and are in good order for allowance and the same is respectfully solicited.

Respectfully submitted,

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Enc. Declaration of Dr. Mark Kelly

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Kenneth H. Johnson

IN THE MATTER OF

UNITED STATES PATENT APPLICATION

GOYAL et al.

FILED 08/20/2001

SERIAL NO: 09/932,883

FOR: POLYMER CONTROL THROUGH CO-CATALYST

DECLARATION

I, Mark Kelly, Chemist, of the City of Airdrie, in the Province of Alberta, Canada declare as follows:

1. I obtained my Ph.D. in Polymer Chemistry, in 1994 from the University of Waterloo and since that time I have worked industrially in the field of polymerization and in particular the polymerization of olefins using Ziegler - Natta type catalysts.

2. I am an inventor named in above noted United States patent application serial no 09/932,883 and have read European Patent Specification EP 0 595 574 entitled Process for the preparation of a Ziegler - Natta type catalyst in the name of Berardi et al., assigned to BP Chemicals Limited, and as such have personal knowledge of the facts declared herein.

3. I have read examples 12 and 13 of the Berardi patent. Some may consider the prepolymer to be the catalyst, however, I consider the real catalyst is used to make the prepolymer in example 13a. Generally, a prepolymer would be made if the catalyst is lacking in some specific area i.e. it is a very hot catalyst which makes a lot of fines when run under standard commercial operations. This

is seen by the level of antistatic component added to the prepolymer. Therefore, I have considered these examples in three parts, the prepolymer, the polymer and the polymer plus the prepolymer

4. The catalyst used to prepare the prepolymer in example 13a was prepared in a manner similar to the one described in example 12, but example 13a contains 2 moles of titanium and 8 moles of tri-n-octylaluminum, which is a cocatalyst. The Al:Ti molar ratio is therefore 4:1 (8/2). This ratio is well below the Al:Ti ratio from 25:1 to 80:1, required in the claims of the patent application. As the prepolymer is produced in a batch polymerization there is no incremental feed of cocatalyst to the reactor during the prepolymerization and as such, there is no Al ppm (for our definition of Al ppm, see the disclosure of the present patent application at page 6 lines 30 - 35). The final resulting prepolymer contains 2700 ppm [$(8 \times 27/80000) \times 10^6$] Al. The resulting prepolymer also contains 1197.5 ppm Ti [$(2 \times 47.9/80000) \times 10^6$].

5. In the case of the polymer in example 13b, 120 g of prepolymer containing 0.003 moles Ti (120 x 2/80000) and 0.012 moles Al (120 x 8/80000) was added into the reactor per hour. If one ignores the active Al in the prepolymer then the only Al added to the reactor is triethyl aluminum (TEAL) at a rate of 24 millimole per hour. This mixture produced polymer at a rate of 16 kg/hr. The Al ppm from the second cocatalyst is therefore $(0.024 \times 27/16000) \times 10^6$ or 40.5 ppm. The amount of Ti in the polymer should be $(0.003 \times 47.9/16000) \times 10^6$ or 9 ppm, which is in agreement with the analysis. The Al:Ti molar ratio for this polymer is

0.024/0.003 or 8:1. This ratio is well below the Al:Ti ratio from 25:1 to 80:1 required in the claims of the patent application.

6. In fact, when the prepolymer and polymer are considered together, the amount of Al added to the reactor would be the amount of Al in the prepolymer plus the additional cocatalyst added during the polymerization. Thus, to make the final polymer, 120 g of prepolymer containing 0.003 moles Ti and 0.012 moles Al was added into the reactor per hour. Also added is the second cocatalyst TEAL at a rate of 24 millimoles per hour. This mixture produced polymer at a rate of 16 kg/hr. The Al ppm from both cocatalysts (i.e. in the prepolymer and the polymer) is therefore $((0.024 + 0.012) \times 27)/16000) \times 10^6$ or 60.75 ppm. This is above the maximum of 50 ppm of Al from the cocatalyst based on the production rate of the polymer required in the claims of the patent application. The amount of Ti in the polymer should be $((0.003 \times 47.9)/16000) \times 10^6$ or 9 ppm which is agreement with the analysis. The Al:Ti molar ratio for this polymer is (0.012 + 0.024)/0.003 or 12:1. This ratio is well below the Al:Ti ratio from 25:1 to 80:1, required in the claims of the patent application.

7. Example 12b is a batch reaction. All of the catalyst and cocatalyst is added at the beginning of the reaction. There is no additional cocatalyst fed into the reactor during the polymerization. Accordingly the cocatalyst parts per million based on the polymer production rate as defined in the patent application (see page 6 lines 30 to 35) is 0. As such example 12b teaches against the subject matter of the patent.

8. In example 12 a) the catalyst comprises 12 moles of trimethyl aluminum, 3 moles of titanium tetra-n-butoxide and 3 moles of titanium tetrachloride. The molar ratio of Al:Ti in the catalyst used to make the polymer in example 12b is 12:6 or 2:1. The catalyst of example 12 a) therefore, has a different composition than that used in example 13b where the Al:Ti ratio is 4:1 as discussed in paragraph 4 above.

9. In example 12 b) the reactor has a 15 cm diameter bed. The feed constitutes 0.54 MPa ethylene; 0.15 MPa hydrogen and 0.21 MPa of 1-butene and the catalyst is as described in paragraph 8 above. In example 13 b) the reactor has a diameter of 45 cm, the feed constitutes 0.07 MPa hydrogen, 0.325 MPa ethylene, 0.058 MPa 1-hexene and 0.85 MPa nitrogen and the catalyst as described in paragraph 4 above. Example 12 b) is a batch reaction and example 13 b) is a continuous reaction. In my opinion one of ordinary skill in the art would not consider that the Al ppm from example 13 b) is in any way applicable to example 12b). Furthermore, as noted above the Al ppm feed based on the polymer production rate in example 12 b) is 0 because the cocatalyst is added only at the start of the reaction, whereas in Example 13b the Al is added continuously at a rate of 60.75 ppm.

10. As example12 b) is a batch reaction, as polymer is produced, the ratio of Al present relative to the amount of polymer produced will vary while the ratio of Al:Ti will be constant. This will affect the physical properties of the polymer including hexane extractables as discussed at the top of page 8 of the disclosure

of the present patent application. Thus in addition to the reasons noted above, example 12 b teaches away from the subject matter in the present patent application because there is no addition of Al cocatalyst during the polymerization in example 12b. Furthermore, there is a changing ratio of Al to polymer produced during the course of the polymerization in example 12b which again teaches away from the present patent application.

Declared before me, at the City of Calgary, in the Province of Alberta this 30 day of July 2004.

Trevor Trott
A Notary Public in and for
the Province of Alberta.

Mark Kelly